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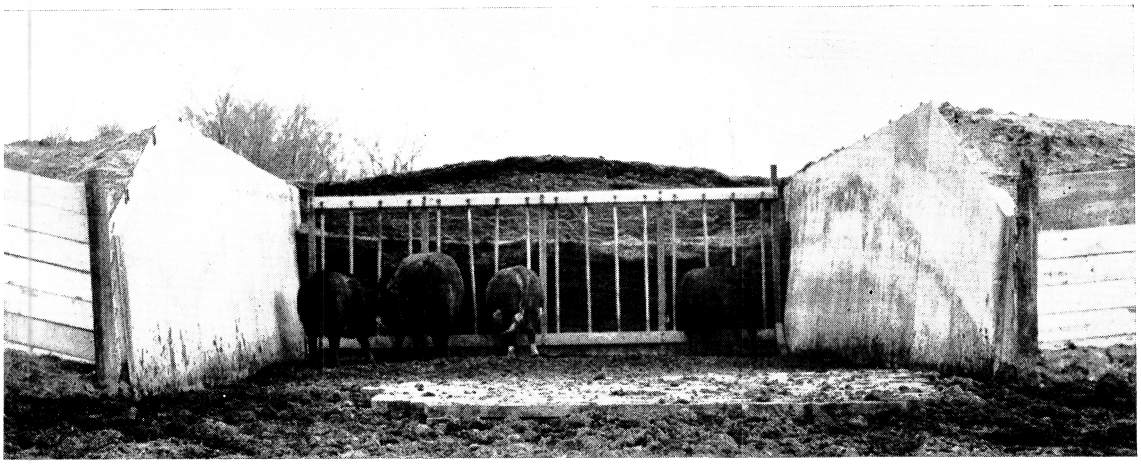

SELF-FEED SILAGE to cut labor

Thousands of Iowa farmers use grass or corn silage as feed for cattle. Under present feeding practices, this calls for many hours of labor; this can be practically eliminated by the use of self-feeding silos.

by Ray E. Armstrong

AT OUR Ankeny Field Station, we have a problem quite common to a great number of Iowa farms where beef cattle are fattened or dairy cattle fed.

In our beef cattle research breeding project at Ankeny, we have the problem of wintering approximately 100 head of breeding cows. Removing ensilage from the silo and delivering it into feeding bunks take many man-hours of labor. And in late winter and early spring, it's difficult to get about in most feed yards. Oftentimes, special equipment is needed to carry out the feeding operation.

Our Answer . . .

As our answer to the problem, we decided to build a self-feeding trench silo for use in our feeding operations. We planned for a herd of 100 head of full-grown cattle and estimated that each animal would eat 40 pounds of silage per day.

We decided to use an effective bottom width of 20 feet, to have the trench open at both ends and to feed from both ends at the same time. This gave us a total feeding width of 40 feet. We believed this to be sufficient to handle 100 animals, providing they ate at all hours of the day and night. The silo runs north and south.

Estimating that we'd need feed for 100 cattle for 180 days, we figured as follows: 100 cattle times 180 days equaled 720,000 pounds or 360 tons of ensilage needed for a normal winter.

Using 35 pounds as the weight of a cubic foot of ensilage in a trench silo of this type, figuring as follows gave us the necessary length to use for the silo: 21 feet of average width (20 feet at floor and 22 feet at a point 8 feet above the floor) times an average height of 8 feet equaled a cross-sectional area of 168 square feet. Each 1 foot of length of this cross-sectional area equaled 168 cubic feet; this times 35 pounds per cubic foot of silage equaled 5,880 pounds of silage per foot of silo. Our total need of 720,000 pounds per season divided by the 5,880 pounds per cubic foot of silo gave us a needed length of 122 feet.

We also needed to consider the rate of "travel" in the feeding of the silage. At least 4 inches of ensilage should be removed each day to prevent spoilage. But 4,000 pounds of silage (100 cattle times 40 pounds per day) eaten each day equaled slightly over 8 inches, which was satisfactory—4 inches fed per day from each end of the silo.

There are, however, some minimum size limitations on this type of structure. A width of about 16

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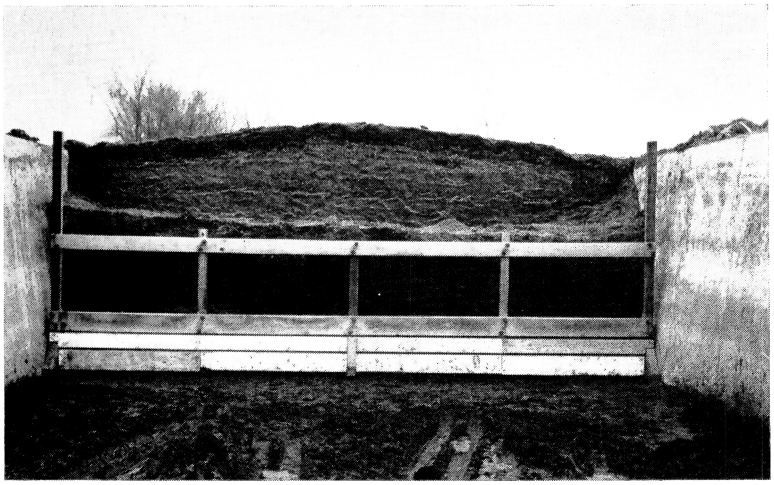
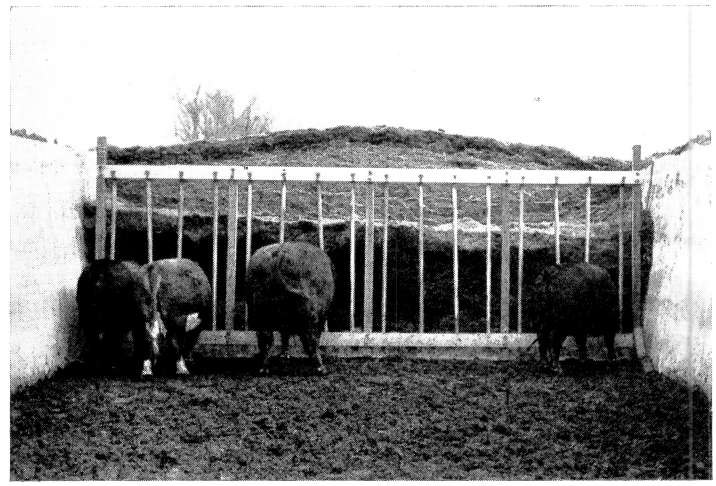




The first type of feed rack used (left) was similar to a conventional feed rack. But we found some limitations with this type of feed rack. The later stanchion-type feed rack (right) permits cattle to reach higher for silage and increases the depth of silage that can be self-fed.

feet is the smallest that can be used and still leave adequate room for filling and packing with conventional farm equipment. A height of 7 feet seems to be about the maximum that can be self-fed without the use of labor.

Construction . . .

In construction, we poured a concrete slab 22 feet wide and 6 inches deep with footings 3 feet in depth (see drawing). The floor was reinforced with wire mesh. A groove 6 inches wide and 1⅝ inches deep was formed along each side of the floor for the side walls to rest in. This groove was formed by inserting a 2 by 6 board flush with the top of the floor when the concrete was poured and removing it later.

The floor has a slope of ⅛ inch vertical drop per horizontal distance of 1 foot from the center of the slab to each side. The floor also has this same slope of ⅛ inch vertical to 1 foot horizontal from the midpoint of the silo to each end. We used an 8-foot concrete sidewall—erected with a slope of 1 foot horizontal to 8 feet vertical.

Drain tiles were laid on each side of the footings at a point 6 inches to the side of the footings and 18 inches from the top of the floor at the edge of the slab. The purpose: to intercept any seepage that might drain in from the earth fill. We installed floor drains near each end of the silo just inside of the sidewall to remove drainage from the silage if needed. The drains were connected to the tile lines.

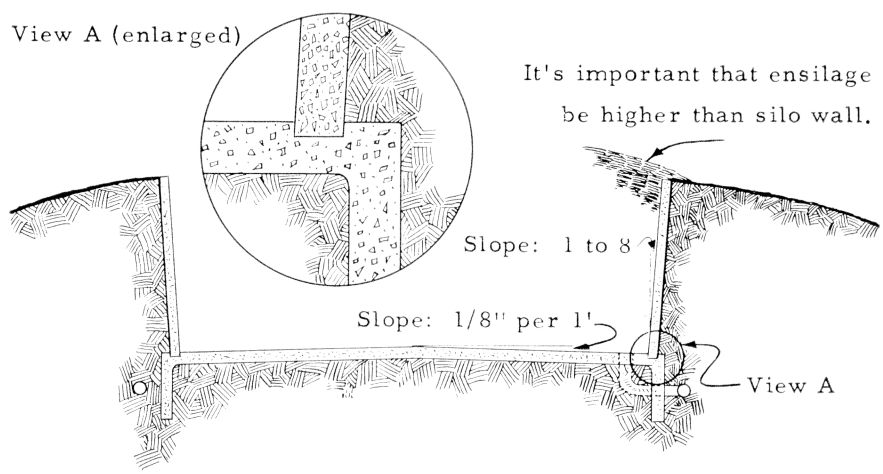
After a floor section had cured, paper was spread on the floor, and forms for the sidewalls were constructed on the floor. The sidewalls were then poured in these forms. Our wall sections are 8 feet long, 5 feet wide and 5⅝ inches thick, reinforced with wire mesh. On each side of the wall sections, a groove similar to the groove in tongue-and-grooved lumber was formed. We cast a heavy ring to be used for lifting in the top of each wall section.

Forms were removed when the wall sections were cured, and the sections then were erected into position. The bottom ends of the sections rest in the groove formed along the edge of the floor slab. We braced the wall sections at the proper slope, and soil was back filled behind the wall.

The entire sidewall, when backfilled and properly aligned, was keyed together by pouring a soft small-aggregate concrete mix in the opening formed by the two matching grooves on the side of each wall section. We fenced the backfilled area to prevent cattle from tramping over the silo and to help establish a seeding on the sloping area to prevent erosion.

Filling the Silo . . .

Various combinations of equipment can be used to fill a silo of this type. Ensilage can be dumped directly from trucks or wagons—probably the most satisfactory way to fill this type of silo. A blower could be used for filling if desired. We used trucks since we had trucks equipped with hydraulic hoists available. These particular trucks had 14- by 8-foot combination grain and livestock boxes.



We filled the silo with mature grass ensilage, using the first cutting of alfalfa and red clover without preservative. We used a direct-cut machine, blowing the ensilage into trucks. We found this system works well when a long haul is necessary from field to silo.

Ensilage was dumped in layers of approximately 1 foot in thickness covering the entire area of the silo. We used a 3-plow tractor with rear tires filled with fluid and extra weights added to pack the ensilage. The tractor was used constantly throughout the filling period and was used 2 hours per day for 10 days following completion of the filling of the silo.

We experienced a minimum of spoilage on the top of the silo and no noticeable spoilage along the sidewalls.

It's very important in filling a trench silo of this type to fill it well above the top of the sidewalls. This insures having the top of the ensilage above the top of the sidewalls after all settling has taken place. This, in turn, makes it possible for water to flow over the sidewalls and prevents water from collecting inside of the sidewalls. This practice is much more effective in preventing spoilage than trying to construct a sharp ridge on top of the silo.

Feeding . . .

We placed a manger for feeding on both ends of the silo. The first feed racks were built similar to conventional feed racks (see photo). These mangers were built with skids on the bottom to prevent the manger from tipping. The skids are approximately 3 feet long, with 2 feet projecting on the side next to the silage and 1 foot on the side next to the cattle. We placed one skid at the center of the manger.

Our experience had indicated that the 2-foot projection is too great in that it requires considerable labor to remove the silage and to allow clearance for skid projection in order to shove the manger close to the silage. We remedied this condition by reversing the manger and having the 1-foot projection of the skid next to the silage.

We originally used the horizontal type of feed rack because some of the cattle had horns, and we thought more efficient use could be made of the feed rack. But there are some limitations to this type of manger. The most serious is that it limits the height and depth to which an animal may eat.

Because of these limitations, we replaced the first type of feed rack with a stanchion-type feed rack as illustrated on one end of the silo. This type of feed rack permits the cattle to reach higher for silage and increases the depth of silage that can be self-fed. This is quite important; as the depth of the ensilage is increased, the ratio of the top surface area to the total volume is decreased, and, thus, there's less chance of spoilage because of the smaller area exposed.

Our experience at Ankeny showed a saving of between 85 and 95 percent of labor normally used in winter ensilage feeding by self-feeding from trench silo of the type described rather than using conventional methods of feeding ensilage.

Manure doesn't present a problem; it isn't frozen and can be removed mechanically at any time. Snow, too, can be handled in this same manner.

The advantages and disadvantages of this type of silage operation as we found them are as follows:

Advantages: (1) labor saving, (2) less equipment needed in filling, (3) less equipment needed in feeding, (4) less pushing and shoving—timid cattle have opportunity to eat, and (5) less equipment cost for storage and feeding than with conventional methods.

Disadvantage: More of the silage surface is exposed than with a vertical silo—but less than with a surface silo.

Costs for the type of trench silo described would vary considerably —depending on size, materials used, equipment used, etc. Importance of the saving in labor, too, would vary according to individual situations. Things to consider: value of alternative uses for the labor saved, the value to you of convenience or additional leisure time gained, etc.

This picture and the one at the beginning of the article show a more complete view of use and construction of the self-feeding trench silo. The advantages and disadvantages, as we found them, for this type of silage operation are listed in the right-hand column above. At right in this picture is an experimental self-feeding hay-storage structure in use at the Ankeny Field Station. A report about this operation is scheduled for *Iowa Farm Science* next month.